

Claims

1. ~~In a phased array, phase-amplitude monopulse radar antenna arrangement, a radar subsystem comprising:~~

5            a phased array antenna including a plurality of radiating elements in phased-relationship to one another and disposed in substantially horizontal rows defining a surface contour and a boresight orthogonal to a central region of said surface contour, said antenna defining separate regions for generating corresponding separate beams of radiation, said separate regions being vertically separated with respect to one another into upper and lower regions, said beams being horizontally skewed left and right from the boresight line;

10            15 feed means for coupling a predetermined illumination pattern to said phased array antenna, said feed means including sum and difference feed means for coupling respective sum and difference monopulse information from said antenna to a signal processing means for interpreting radar return signals; and

20            25 a plurality of phase shift means for controllably modifying the phase of electromagnetic energy coupled between said feed means and said phased array antenna;

25            30 *a*        said upper and lower regions of said phased array antenna being <sup>physically</sup> set in oppositely disposed directions, whereby said monopulse information provided to said signal processing means provides a basis for developing target indications with respect to elevation angle and azimuth.

2. The method of establishing a phased array, phase-amplitude monopulse radar antenna arrangement including a radar subsystem, said method comprising the steps of:

- 5       (a) placing a plurality of electromagnetically radiating elements in phased-relationship to one another to establish a phased array antenna, said radiating elements being disposed in substantially horizontal rows defining a surface contour and a  
10 boresight orthogonal to a central region of said surface contour, said antenna defining separate regions for generating corresponding separate beams of radiation, said separate regions being vertically separated with respect to one another into upper and  
15 lower regions, said beams being horizontally skewed left and right from the boresight line;
- (b) coupling a feed means to said phased array antenna for applying a predetermined electromagnetic illumination pattern to said phased array antenna,  
20 said feed means including sum and difference feed means for carrying respective sum and difference monopulse information from said antenna to a signal processing means for interpreting radar return signals;
- 25       (c) interposing between said feed means and said phased array antenna, a plurality of phase shift means for controllably modifying the phase of electromagnetic energy coupled between said feed means and said phased array antenna;

(d) disposing said upper and lower regions of  
said phased array antenna in <sup>physically</sup> oppositely disposed  
directions, whereby said monopulse information  
provided to said signal processing means provides a  
5 basis for developing target indications with respect  
to elevation angle and azimuth.

3. The invention of claims 1 or 2, wherein said  
feed means includes a plurality of coupling means for  
directionally coupling electromagnetic energy with  
10 respect to each of said horizontal rows of radiating  
elements, each of said coupling means being effective  
for communicating electromagnetically with each of  
said sum and difference feed means.

4. The invention of claims 1, 2 or 3, wherein each  
15 of said plurality of phase shift means is effective  
for controllably modifying the phase of  
electromagnetic energy coupled between said feed  
means and a single one of said horizontal rows of  
radiating elements.

20 5. The invention of claims 1 or 2, wherein said  
radar subsystem further comprises a signal processing  
~~means for interpreting radar return signals.~~